HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Upriver Bright Fall Chinook Program
Species or Hatchery Stock:	Upriver Bright Fall Chinook Salmon (*Oncorhynchus tshawytscha*)
Agency/Operator:	U.S. Fish & Wildlife Service Little White Salmon/Willard NFH Complex
Watershed and Region:	Little White Salmon River
Date Submitted:	10/07/2002
Date Last Updated:	10/04/2002

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Upriver Bright Fall Chinook Program - Little White Salmon/Willard NFH Complex

1.2) Species and population (or stock) under propagation, and ESA status.
Upriver Bright Fall Chinook Salmon (*Oncorhynchus tshawytscha*). This population is not listed under the Endangered Species Act.

1.3) Responsible organization and individuals

Name (and title): Lee Hillwig (Fish and Wildlife Administrator)
Agency or Tribe: U.S. Fish and Wildlife Service (USFWS)
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Name (and title): Speros Doulos (Complex Manager)
Agency or Tribe: Little White Salmon/Willard NFH Complex
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Email: speros_doulos@fws.gov

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- National Marine Fisheries Service (NMFS) - funding agency via Mitchell Act.
- Yakama Nation receives production for tribal restoration program funded by the Bonneville Power Administration (BPA).
- U.S. *v* Oregon parties - co-managers of fisheries.
- U.S. Army Corps of Engineers (USACE) for funding

1.4) Funding source, staffing level, and annual hatchery program operational costs.
Funding for the program is from Mitchell Act funds administered by NMFS with additional funding for off-station rearing and programs from the USACE. The complex has thirteen full time employees and an annual operating budget in fiscal year 2002 of $1.14 million for all programs. The on-station releases had a budget of $231,196 from Mitchell Act money while the off-station releases had a budget of $54,200 from the USACE.

1.5) Location(s) of hatchery and associated facilities
Little White Salmon NFH is located on the Little White Salmon River at river kilometer 2, approximately 19 kilometers east of Stevenson, Washington. The hatchery is situated just above Drano Lake, a water body where the Little White Salmon River joins the Columbia River at river kilometer 261. This position is approximately 45˚ 42' 30" North

Latitude and 121˚ 37' 30" West Longitude (pers. comm. Steve Vigg, NMFS). Site elevation is about 27 meters above sea level.

1.6) Type of program.

Isolated harvest

1.7) Purpose (Goal) of program.

The purpose of the program is to successfully rear and release upriver bright fall Chinook salmon into the Little White Salmon River to provide mitigation (production for fisheries) for federal hydro-power construction, and other development, to meet obligations under the U.S. *v* Oregon court agreement and to produce 1.7 million fry for transfer to the Yakima River basin. A total of 2 million sub-yearling upriver bright fall Chinook salmon are reared and released from Little White Salmon National Fish Hatchery as part of the U.S. Army Corps of Engineers (USACE) John Day Dam mitigation program (see Yakima Program in Section 1.8 of this document). It also provides fish to reaffirm tribal treaty granted fishing rights as mandated by U.S. *v* Oregon.

1.8) Justification for the program.

Little White Salmon River Program:

The Little White Salmon/Willard NFH Complex (Complex) currently operates as part of the Columbia River Fisheries Development Program, a part of the Mitchell Act, a program to provide for the conservation of Columbia River fishery resources. This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by the construction and operation of the John Day Dam. The Columbia River Fish Management Plan is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan.

Yakima Program:

The Yakima program is not evaluated in this HGMP. It will be covered under a separate HGMP for the BPA funded program. A total of 1.7 million upriver bright fall Chinook are reared at the Little White Salmon/Willard National Fish Hatchery Complex and transferred by Service personnel to acclimation ponds on the Yakima River, WA. This project is a critical component of the Service's obligation under the U.S. *v* Oregon agreement to assist with the development of naturally spawning fish stocks on tribal lands in the mid-Columbia River basin. Funding received from the USACE is used to provide feed to the tribal fisheries program to assist with the off-site rearing of these fish following transfer and during the acclimation period. USACE funds are also used to feed an additional 1.7 million upriver bright fall Chinook salmon located at the Priest Rapids Hatchery under co-manager agreement and to meet U.S. *v* Oregon agreement obligations. Adult fish returning to the Yakima River are designated for the development of locally adapted, naturally spawning populations within the Yakima River Basin.

1.9) ist of program "Performance Standards".

The following standards are adapted from IHOT (1995).

1) Hatchery Production
   Produce 2.0 million subyearling smolts for on-station release.
   Produce 1.7 million subyearling fry for transfer to the Yakima River.

2) Minimize interactions with other fish populations through proper rearing and release strategies.

3) Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

4) Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

5) Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

6) Communicate effectively with other salmon producers and managers in the Columbia River Basin.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

BENEFITS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
1. Provide predictable, stable, and increased opportunity for harvest.	Adult survival and annual contribution to recreational, commercial and tribal fisheries.	Continued analysis of CWT returns through CRiS and PSMFC database (see Table A).
2. Achieve genetic and life history conservation.	1860 adults are spawned (1:1 male:female sex ratio) annually. Fecundity is approximately 5000 eggs per female. Average adult body size is 96 cm F.L. Isolation of species from others returning at the same time. *NA for mitigation hatcheries (APR 1999).*	Separation by species (see section 7.6). Annual evaluation of life history characteristics: juvenile preparedness for seawater entry, fecundity, body size, sex ratio, distribution and straying (through CRiS)See section 3.5.4.3 on genetic effects on other species.

BENEFITS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
3. Enhance tribal, local, state, regional and national economies.	Contribution to all fisheries established.	Draft economic analysis was conducted in 1997 (Montgomery Watson 1997).
4. Fulfill legal/policy obligations.	Legal and policy goals established by US v Oregon and John Day Dam Mitigation policies are met (note: there are currently no policy goals for numbers to the fishery, only for production goals).	Annual evaluation of fish counted in the fishery by state, tribes, and USFWS. Production goals are monitored and met annually.
5. Contribution of fish carcasses to ecosystem function by subbasin and by hatchery.	Hatchery Research Monitoring and Evaluation (RM & E) plans in IHOT.	Carcasses are not outplanted due to disease concerns (See sections 3.5.4 and 7.8).
6. Provide fish to satisfy legally mandated harvest.	See sections 2.2.1 and 2.2.2.	There are no other affected stocks in the watershed.
7. Will achieve within-hatchery performance standards.	IHOT standards	IHOT standards are monitored See sections 1.8, 1.9, 1.12, 3.2, 4.1, 5.8, 7.7, 7.9, 8.3, 10.11.
8. Restore and create viable naturally spawning populations.	No spawning habitat available.	NA
9. Plan and provide fish with coordinated mainstem passage and habitat research.	Developed release protocols. *NA for mitigation hatcheries (APR 1999).*	Releases annually determined to coincide with expected maximum river flows (see section 10.4).

BENEFITS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
10. Conduct within-hatchery research, improve performance or cost effectiveness of artificial production hatcheries to address the other four purposes (augmentation, mitigation, restoration and conservation).	Research on performance indicators *NA for mitigation hatcheries (APR 1999).*	Onsite evaluation of physiological condition of released fish to reduce ecological interactions (more in section 9.2.8) Also see sections 9.2.9 and 12.
11. Minimize management, administrative, and overhead costs.	IHOT and USFWS audits. *NA for mitigation hatcheries (APR 1999).*	Audits conducted periodically and results integrated (see sections 1.8, 1.9, 3.2, 3.5, 4.1, 5.8, 7.7, 7.9, 8.3, 10.11).
12. Improve performance indicators to better measure performance standards.	Adaptive management. *NA for mitigation hatcheries (APR 1999).*	Continuous adaptive management: e.g. implementation of naturally colored raceways (section 9.2.9) and annual monitoring of seawater tolerance (see section 9.2.8).

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
1. Develop harvest management plan to protect weak populations where mixed population fisheries exist.	Annual harvest of Fall fisheries are within the Harvest Biological Opinions.	Performance of URB are monitored for distribution and straying (via CWT collections). Joint staff report developed annual for Fall fishery. Genetic introgression with other stocks is unlikely (see section 3.5).
2. Do not exceed the carrying capacity of fluvial, lacustrine, estuarine, and ocean habitats.	RM & E plans established.	Monitoring has not been conducted on this topic previously or currently.

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
3. Assess detrimental genetic impacts among hatchery vs. wild where interactions exist.	Evaluation of stray rates.	Stock assessment report produced annually by USFWS and posted at http://columbiariver.fws.gov
4. Unpredictable egg supply leading to poor programming of hatchery production.	Achieve percent egg take goal in 4 out of 5 years (See sections 6.2.1 and 7.4.2). IHOT disease protocols implemented (See sections 7.7 and 7.9).	Annual evaluation of adult returns (See sections 6.2.1, 7.4.2, 7.7, and 7.9).
5. Production cost of program outweighs the benefit.	Evaluate trends in juvenile production cost.	Montgomery Watson 1997 Hatchery Evaluation report (part of IHOT evaluation).
6. Cost effectiveness of hatchery ranked lower than other actions in subregion or subbasin.	Social/economic effectiveness.	Economic analysis needs to be conducted.
7. Will not achieve within-hatchery performance standards.	Comparative evaluation of within-hatchery standards	IHOT standards are met annually.
8. Evaluate habitat use and potential detrimental ecological interactions.	No habitat available within the watershed adjacent to the hatchery. For impacts in other watersheds see section 3.5.	NA
9. Avoid disease transfer from hatchery to wild fish and visa versa.	Comply with IHOT standards and USFWS policy.	See sections 3.5, 4.1, 5.4, 5.8, 7.8, 7.9, 9.2.7, 10.11
10. Evaluate impacts on life history traits of wild and hatchery fish from harvest and spawning escapement.	Track trends of life history characteristics of hatchery fish (no wild fish in this system).	Annual evaluation of: Adult age distribution, fecundity, body size, sex ratio, juvenile size (e.g. data in section 9.2), distribution and straying (annual compilation of CWT data from the CRB).

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
11. Assess survival of captive broodstock progeny vs. wild cohorts.	*NA for mitigation hatcheries (APR 1999).*	
12. Depleting existing population spawning in the wild through broodstock collection.	*NA for mitigation hatcheries (APR 1999).*	

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

Hatchery adult URB capture goal is 1,860 fish. The average number spawned for the years 1997 to 2001 was 2,404 fish with a range of 1,756 to 3,546 fish (see Section 6.2.2 and Section 7.4.2).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Egg	N/A	N/A
Unfed Fry	N/A	**N/A**
Fry	N/A	N/A
Fingerling	Little White Salmon R. Transfer to Yakama Nation	2,000,000 1,700,000
Yearling	N/A	N/A

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

The following is a program summary adapted from IHOT (1996) and updated for this document. Adult capture includes all adults entering the facility, not just the number spawned (see Section 1.11.1).

Measures	Hatchery Goal	5-Year Average	Range
Adult Capture[1]	1,860	4,206	2,818 - 7,699
Fish Releases[1]	2 Million	2.0M	1.8M - 2.2M
Egg Transfers[1]	0	0	0
Fish Transfers[1]	1.7 Million	2.8M	2.2M - 3.2M
Adults Passed Upstream[1]	0	0	0
Percent Survival, Juvenile to Adult[2]	1.0%	0.32%	0.06% - 0.66%
Smolt Size at Release (fish/lb)[1]	100	76.8	56 - 109

[1] Five year average and range from calendar years1997 - 2001.
[2] Five year average and range from completed brood years1990-1994. Information from Pastor (2001)

1.13) Date program started (years in operation), or is expected to start.

The program began in 1983 with the release of 1982 brood year fish from the Spring Creek NFH.

1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Little White Salmon River Program:

The Little White Salmon River below Little White Salmon NFH (i.e. Drano Lake) is the target watershed. The Water Resource Inventory Number (WRIA) number is 29.0131.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

Mainstem Columbia River and Snake River Dam removal to restore habitat has been considered but is not currently regarded as a realistic alternative. Refer to the NMFS Hydrosystem Biological Opinion on the subject.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

The hatchery has authorization under the NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin 1999. Section 7 permits were obtained for construction projects from NMFS (WSB-00-360 dated 06/28/2000 good through 09/30/2001) and from an Internal Section 7 Consultation (permit number 1-3-00-FW-1914, 1915) from the USFWS Western Washington Office in Lacey, Washington. See also Addendum A.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

There are no ESA listed salmonids that will be directly affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

- Identify the ESA-listed population(s) that will be directly affected by the program.

There are no ESA listed salmonids that will be directly affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

There are no ESA listed salmonids that are anticipated to be affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.

There are no known listed natural origin salmonids on natural spawning grounds in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.
There are no known listed natural populations in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.
There are no known listed natural populations in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.
This data is not available. There are no known listed natural populations in the Little White Salmon River.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.</u>

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
There is potential to take listed species through observation, migrational delay, capture and handling during ladder operation at the Little White Salmon NFH between mid-September and early November. Trapping and handling devices and methods may lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation. No listed species, however, has been recorded entering the facility during fall Chinook operations.

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.
No listed species have been recorded entering the hatchery facility during fall Chinook operations.

-**Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**
No take of listed species is anticipated.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.
If any listed species are identified entering the hatchery, they will be returned to the river via a return tube that empties below the fish ladder entrance.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.
The hatchery program will be operated consistent with ESU-wide plans as listed in section3.2.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.
The upriver bright fall Chinook program is consistent with:

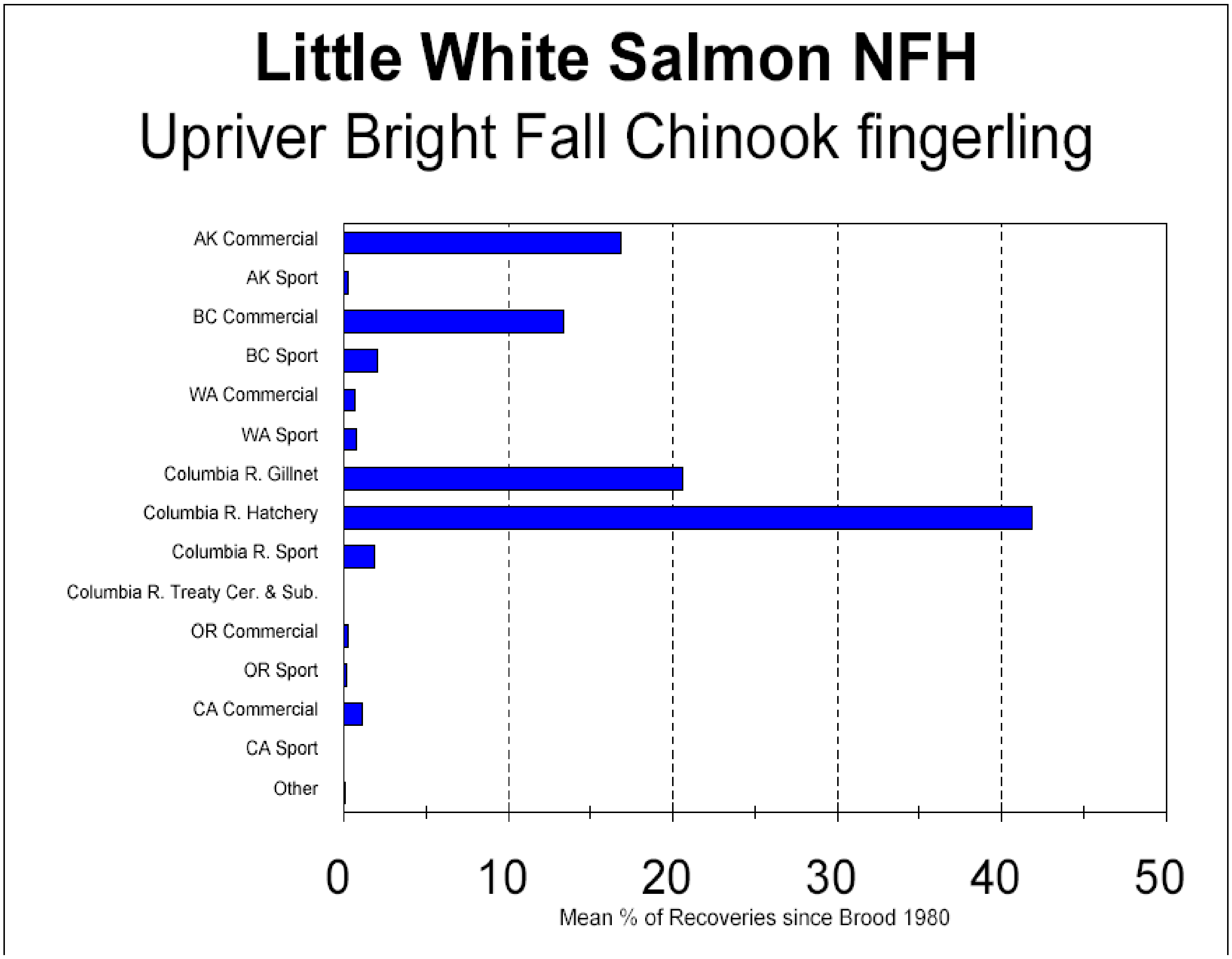
- U.S. *v* Oregon Columbia River Fish Management Plan (currently under re-negotiation).
- U.S. Army Corps of Engineers John Day Dam Mitigation.
- Mitchell Act.
- NPPC Little White Salmon River Subbasin Salmon and Steelhead Production Plan - hatchery production strategy.
- NMFS 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin.
- 1999 Management Agreement for Upper Columbia River Fall Chinook, Steelhead and Coho (under U.S. *v* Oregon).
- IHOT Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries.

This HGMP is consistent with these plans and commitments.

3.3) Relationship to harvest objectives.
Harvest management decisions are made by the states of Washington and Oregon along with Columbia River treaty tribes in consultation with NMFS and USFWS.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.
The upriver fall Chinook program fish have contributed to commercial and sport fisheries along the west coast of the U.S. and Canada from Alaska to California. Of the fall Chinook from Little White Salmon NFH that reach catchable size, commercial fisheries in Alaska, British Columbia and gillnet fisheries in the Columbia River each harvest greater than 10%. Sport fisheries in B.C. and the Pacific coast states account for a much smaller percentage of adult fish caught. More detailed information is available in the Stock Assessment Report (Pastor, 2001) and in Table 1 and Graph A below.

Table 1. Coded-wire tag recoveries from brood years 1990-1995. For further details see Pastor (2001).



Brood Year	Harvest # of Adults	Hatchery Return	Total Return	Harvest Rate
1990	6,174	7,061	13,235	46.6%
1991	3,376	2,461	5,837	57.8%
1992	2,871	3,892	6,763	42.5%
1993	6,897	6,678	13,575	50.8%
1994	927	708	1,635	56.7%
1995	2,384	2,624	5,008	47.6%

Graph A. Figure 1. Adult Harvest of Little White Salmon NFH Upriver Fall Chinook Salmon. (Pastor, 2001). Analysis of tag recoveries from Brood Years 1980 to 1992.

3.4) Relationship to habitat protection and recovery strategies.

This program is an ongoing mitigation program as defined in Table 1 of Section IIC of the Artificial Production Review (NWPPC, 1999) and is consistent with the John Day Mitigation Program and the U.S. *v* Oregon Management Plan.

3.5) Ecological interactions.

Salmonid and non-salmonid fishes or other species that could:

1) negatively impact program;

A variety of freshwater and marine predators such as northern pikeminnows, Caspian terns, and pinnipeds, can significantly reduce overall survival rates of program fish. Predation by northern pikeminnow poses a high risk of significant negative impacts on the productivity of hatchery Chinook (SWIG 1984). Based on PIT tags recovered at a large Caspian tern nesting colony on Rice Island, a dredge material disposal island in the Columbia river estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1997).

A NMFS Working Group (NMFS 1997) determined that California sea lion and Pacific harbor seal populations in the three west coast states have risen by 5-7% annually since the mid-1970s. Their predation on salmonids may now constitute an additional factor on salmonid population declines and can affect recovery of depressed populations in some situations. See the ecological interactions discussion below.

2) be negatively impacted by program;

Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Willamette River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Upper Willamette River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). An additional concern is the Southwestern Washington/Columbia River coastal cutthroat trout ESU. See the ecological interactions discussion below.

3) positively impact program;

Returning Chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system.

4) be positively impacted by program;

A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Reductions and extinctions of wild populations of salmon could reduce overall ecosystem productivity. Because of this, hatchery production has the potential for playing an important role in population dynamics of predator-prey relationships and community ecology. The Service speculates that these relationships may be particularly important (as either ecological risks or benefits) in years of low productivity and shifting climactic cycles.

In addition, wild co-occurring salmonid populations might be benefitted as schools of hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. See the ecological interactions discussion below.

The 1999 Biological Assessment for the Operation of Hatcheries Funded by the National Marine Fisheries Service under the Columbia River Fisheries Development Program (NMFS 1999b) and the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999c) present a discussion of the potential effects of hatchery programs on listed salmon and steelhead populations. The reader is referred to the discussion in those documents.

Nine generalized types of effects that artificial propagation programs can have on listed salmon and steelhead populations were identified. These effects include: 1. Hatchery operation, 2. Brood stock collection, 3. Genetic introgression, 4. Hatchery production (density-dependent), 5. Disease, 6. Competition, 7. Predation, 8. Residualism, and 9. Migration corridor/ocean. Potential effects in these categories may apply to all hatchery programs to one degree or another depending on the particular program design.

A discussion of ecological interactions relative to the Complex's upriver bright fall Chinook program follows:

1. Hatchery operation- The water source for the Little White Salmon NFH is withdrawal from the Little White Salmon River, a series of springs, and a well. An impassable falls immediately upstream from the hatchery site precludes anadromous fish passage into the upper basin. Water withdrawals for hatchery operation do not impact listed anadromous species because the intake structure is above a barrier dam and there is essentially no natural spawning or rearing habitat accessible to anadromous species in the basin. Hatchery effluents meet established NPDES release standards criteria and are diluted by the flow in the Little White Salmon River, reducing potential negative impacts to natural stocks.

2. Brood stock collection- Upriver bright fall Chinook are not native to the Little White Salmon River basin and are not a part of the lower Columbia River Chinook ESU. This stock was

introduced as part of the John Day Dam mitigation program in the early 1980s. Because upriver brights are an introduced stock for this area, there is a higher level of concern regarding potential ecological effects, especially hatchery introgression effects, if wide spread straying of this stock occurs. Returning upriver bright fall Chinook are collected for brood stock at the Little White Salmon NFH rack near the mouth of the river. Stray tule fall Chinook, presumably from Spring Creek NFH, are also collected but not spawned unless there is an identified shortfall at Spring Creek NFH, at which time Little White Salmon NFH may collect tule fall Chinook eggs and transfer them to Spring Creek NFH. Numbers of tule fall Chinook returning and spawned for this purpose are generally very low. Temporal separation of spawning times (tules generally spawn about a month earlier) as well as differing visual characteristics of the two stocks assist in avoiding hybridization of the two stocks. Little White Salmon NFH also receives stray upriver bright fall Chinook from Bonneville Hatchery releases (same stock) based on coded-wire tag (CWT) recoveries. CWT recoveries from upper Columbia and Snake River basin upriver bright fall Chinook are rare.

3. Genetic introgression- Complex upriver bright fall Chinook are known to contribute to natural spawning populations in the local tributaries of the Wind and Big White Salmon rivers. CWT recoveries from Complex upriver bright fall Chinook have been recovered in annual spawning ground surveys and upriver bright fall Chinook have been colonizing these local tributaries since the mid 1980s (Harlan 1999). There is essentially very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historical tule fall Chinook habitat was inundated by Bonneville Pool when Bonneville Dam was constructed in 1938.

Although upriver bright fall Chinook are colonizing the nearby Wind and Big White Salmon tributaries, the potential for genetic introgression with the local tule populations is diminished by the temporal separation in spawn timing of the two stocks, with tules spawning in September and early October and upriver brights spawning in late October and November. It is believed that the tule populations in the Wind and Big White Salmon rivers may be largely supported by Spring Creek NFH strays (NMFS 1999a). Thus, it appears that both the tule and upriver bright naturally spawning populations of fall Chinook in the Wind and Big White Salmon rivers may be heavily influenced by hatchery strays. However, the fall Chinook natural production areas in these tributaries is very limited and comprise a very minor part of the lower Columbia River Chinook ESU as a whole. Therefore, the potential negative effect on the ESU as a whole is likely to be relatively minor. It would be advantageous to begin collecting genetic samples from the naturally spawning populations of tules and upriver brights in the two tributaries for comparison with samples from Spring Creek tules and Complex upriver brights as well as for comparison with samples from other natural populations in the lower Columbia River to determine and monitor the genetic stock structure of the various populations.

4. Hatchery production (density dependent effects)- Complex upriver bright fall Chinook releases from the facility are moderate in magnitude (typically about 2.0 million fall Chinook smolts) relative to other Columbia River fall Chinook production programs (e.g. Spring Creek NFH releases over 7 million smolts in March). This level of release is not expected to cause serious density dependent effects in the mainstem Columbia River. Complex fall Chinook are

assumed to migrate rapidly after release. PIT tagging would help to test this assumption, but would require additional funding.

5. Disease-Under the guidance of the USFWS Lower Columbia River Fish Health Center (LCRFHC), the Complex follows the US Fish and Wildlife Service's fish health policy (713 FW in the Fish and Wildlife Service Manual) and Integrated Hatchery Operations Team (IHOT 1995) protocols to produce healthy fish and prevent disease transmission (see sections 9.1.6 and 9.2.7). Most pathogens enter hatcheries through returning adult fish, surface water supplies, and other mechanisms involving direct contact with naturally spawning fish. Procedures used at the hatchery and the LCRFHC reduce pathogen transmission from these sources. The fish health goal for Complex upriver bright fall Chinook is to release healthy fish that are physiologically ready to migrate. The upriver bright fall Chinook are relatively disease-free and have a reduced potential for transmission of disease to other populations relative to other upriver programs which are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems. The Complex takes appropriate measures to control disease and the release of diseased fish. As a consequence, infection of natural fish by hatchery fish would not appear to be a problem.

6. Competition- The impacts from competition are assumed to be greatest in the spawning and nursery areas at points of highest density (release areas) and diminish as hatchery smolts disperse (USFWS 1994). Salmon and steelhead smolts actively feed during their downstream migration (Becker 1973; Muir and Emmett 1988; Sager and Glova 1988). Competition in reservoirs could occur where food supplies are inadequate for migrating salmon and steelhead. However, the degree to which smolt performance and survival are affected by insufficient food supplies is unknown (Muir and Coley 1994). On the other hand, the available data are more consistent with the alternative hypothesis that hatchery-produced smolts are at a competitive disadvantage relative to naturally produced fish in tributaries and free-flowing mainstem sections (Steward and Bjornn 1990). Although limited information exists, available data reveal no significant relationship between level of crowding and condition of fish at mainstem dams. Consequently, survival of natural smolts during passage at mainstem dams does not appear to be affected directly by the number - or density - of hatchery smolts passing through the system at present population levels. While smolts may be delayed at mainstem dams, the general consensus is that smolts do not normally compete for space when swimming through the bypass facilities (Enhancement Planning Team 1986). The main factor causing mortality during bypass appears to be confinement and handling in the bypass facilities, not the number of fish being bypassed.

Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in or immediately above the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

The release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate from the release site. The Complex's upriver bright fall Chinook are released at the Little White Salmon NFH site. It is assumed that they migrate quickly through Drano Lake and into the mainstem Columbia River migration corridor en route to the ocean, reducing the potential for competitive interactions with listed stocks. There have been no mortalities recorded during saltwater challenges conducted during the last three brood years. Released fish have been fully smolted and begin their downstream migration immediately following release. PIT tagging would also provide valuable confirmation information on the timing and speed of emigration. This would require additional funding. Because releases occur "low" in the Columbia River Basin system relative to many other upriver programs, there is reduced opportunity for competitive interactions among juveniles. However, competitive interactions between the Complex's adult upriver and tule fall Chinook may be occurring in local spawning tributaries.

Coded-wire tag recovery data can be used to document straying rates of program fish. Data extracted from the Columbia River Information System (CriS) and Pacific States Marine Fish Commission (PSMFC) databases (Pastor 1999) can be indicative of straying and homing of program fish. Analyses are currently underway.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Water rights for the Little White Salmon NFH total 33,868 gpm from the Little White Salmon River, a small well and springs. Water use for fish production ranges from 11,221 gpm to 28,232 gpm. The river supplies most of this water flow. The water intake structure was rebuilt in 1994 and modified in 2001. A water re-use system was constructed in 1967 for egg incubation, but has not been operated for several years. The re-use system was originally used to supplement water supplies for incubation in low water years, but has not been needed since the well was upgraded. Use of the reused water is avoided whenever possible due to disease transmission concerns. An independent hatchery audit (Montgomery Watson 1997) measuring hatchery operations against IHOT standards (IHOT 1995) reported a remedial action was needed to provide disease-free water for incubation and early rearing (4,700 gpm). The estimated cost was $2.7 million. Such a system would also benefit the incubation and early rearing of spring Chinook and the incubation of coho.

The Complex's water intake structure was examined during the independent audit (Montgomery Watson 1997). The structure was in compliance when measured against

NMFS's screening criteria for approach velocity and screen openings. The hatchery monitors water discharges and is in compliance with the NPDES permit.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

As stated above in section 4.1, the hatchery intake structure is above an impassable barrier dam which prevents listed anadromous species from having access to the main water supply. The hatchery's effluent discharge is well within it's NPDES permit and is further diluted by the Little White Salmon river further reducing any possible negative impacts.

SECTION 5.   FACILITIES

5.1) Broodstock collection facilities (or methods).

Fish enter the spawning facility volitionally via a fish ladder that opens immediately below the hatchery barrier dam. Once inside the trap, the fish are crowded up to a grader using mechanical crowders to separate out coho salmon that return concurrently with the fall Chinook. After grading, the adult Chinook are held in a 30' X 90' X6' holding pond.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Adult fish are moved from pond to pond and into the anaesthetic tank using hydraulically operated mechanical crowders.

5.3) Broodstock holding and spawning facilities.

Brood holding facilities include two 30' X 90' X 6' holding ponds. Spawning facilities include a transfer tower to move fish from the holding ponds into the anaesthetic tank where fish are sorted. Fish not ready to spawn (green fish) are returned to the holding ponds via return tubes. Ripe fish are handled on a stainless steel spawning table.

5.4) Incubation facilities.

Incubation is done in the nursery building about 0.5 km from the spawning facility using up to 72 of 132 stacks of vertical incubators with flows set initially to 3 gpm and raised to 5 gpm at hatching. Water for incubation is primarily from springs and a well, with screened river water available if needed. The eggs are treated between three and five times a week with 1,667 ppm formalin for fifteen minutes to control fungus. The formalin is delivered using a newly constructed delivery system which ensures proper dilutions and timing. The installation of egg isolation units has been proposed to prevent potential disease transmission from eggs transported from outside the facility to Little White Salmon stocks.

5.5) Rearing facilities.

Rearing is performed in newly constructed (2001-2002) 10' X 110' X 3.5' mocha colored raceways with maximum flows of approximately 800 gpm. Baffles are being evaluated to determine their usefulness with these fish.

5.6) Acclimation/release facilities.
Fish are released directly from the raceways into the Little White Salmon River below the barrier dam.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
Since the Upriver Bright Fall Chinook program has been at Little White Salmon there has been only one significant fish loss. This occurred in January, 1998 due to equipment/ operational errors in a new mixing box supplying spring water to the nursery. The error unfortunately led to the asphyxiation of 3,198,321 fall Chinook sack-fry still in the incubators. Operation procedures have been modified and an additional alarm probe has been installed to prevent future incidents.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.
The hatchery has low water alarm probes positioned in several locations to prevent fish losses due to water system failures. The alarm system is equipped with radio pagers and an automatic phone dialer in case of emergency. Fish disease transmission is managed in accordance with the US Fish and Wildlife Service's fish health policy and IHOT recommendations.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.
The original source of this stock is from up-river bright (URB) fall Chinook trapped at the Bonneville State Fish Hatchery. The current source is from adult URB fall Chinook returning to the Little White Salmon River.

6.2) Supporting information.
6.2.1) History.
The "mid-Columbia Bright" brood stock was developed in 1977 when upriver bright fall Chinook were trapped from the Bonneville Dam fish ladder and spawned at Bonneville Hatchery (CRFMP All-Species Review 1997). Following an unsuccessful attempt to rear upriver bright fall Chinook that started in 1982, along with tule fall Chinook at Spring Creek NFH, the John Day Dam upriver bright mitigation program was moved to the Little White Salmon/Willard NFH Complex in 1988.

The following lists all the fall Chinook stocks that have been transferred to the Little White Salmon/Willard NFH Complex during the last 5 brood years. All stocks were received during 1998 to meet production shortfalls due to the above mentioned mechanical-caused loss of progeny from fish that had returned to the Complex:

1,213,000 upriver bright fall Chinook (URB) from Klickitat SFH, WA
13,168 URB from Lyons Ferry SFH, WA
2,054,000 URB from Bonneville SFH, OR
600,000 URB from Priest Rapids SFH, WA
200,000 URB from Umatilla SFH, OR

6.2.2) Annual size.
Adult upriver bright fall Chinook enter the hatchery holding ponds from mid-October through mid-November. Spawning occurs from late October to mid November. Total adult returns ranged from 3,498 to 7,860 averaging 5,442 for the period 1997 to 2001. The annual escapement goal is 1,860 adults returning to the hatchery (see Section 1.11.1 and Section 7.4.2 for number of adults spawned).

6.2.3) Past and proposed level of natural fish in broodstock.
As stated in Bryant (1949), the backwater from Bonneville Dam covers all of the area that was originally suitable for salmon spawning. In addition, a natural waterfall located about 0.8 kilometers above the hatchery barrier dam (built in 1974) had historically blocked access to spawning habitat located above the hatchery. Fluctuations in the level of the Bonneville Pool are seen immediately below the barrier dam. Historical literature reviews indicate that the only original native stock were the tule fall Chinook and late-run coho (Nelson and Bodle 1990). Both are extinct from the watershed and there are no naturally spawning populations. Remnants of the original Tule stock were transferred to Spring Creek NFH during the mid-1980's. There has been no past or proposed future level of natural fish used as brood stock for the upriver bright fall Chinook currently produced at the Little White Salmon/Willard NFH Complex.

6.2.4) Genetic or ecological differences.
As stated in section 2.2.2 above, there are no natural stocks in the Little White Salmon River.

6.2.5) Reasons for choosing.
All stocks of upriver bright fall Chinook were chosen due to their availability. Refer to Section 1.7 of this document for further details.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.
No adverse genetic effects to listed species are expected from the fall Chinook broodstock selection process. See Section 3.5 of this document for a detailed discussion on this topic.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2) Collection or sampling design.

The collection of upriver bright fall Chinook occurs concurrently with the collection of coho salmon. Ladder operations begin during the third week of September. Historical records indicate that coho are the first fish collected and that an earlier ladder opening results in the collection of stray tule fall Chinook from Spring Creek NFH. Upriver bright fall Chinook begin their upstream migration in the Little White Salmon River later than coho, with the first fish collected near mid-October. The hatchery ladder is operated until maximum densities in the ponds are achieved. If this occurs, the ladder is closed until excess fish are randomly removed from the ponds or fish are removed during spawning. The ladder is then reopened to continue collecting adults from the full spectrum of the return run. Generally, the hatchery ladder is closed by mid-November.

7.3) Identity.

There are no naturally spawning populations of upriver bright fall Chinook within the Little White Salmon River watershed. As a result, differential marking is not required. An index group of approximately ten percent of juveniles released into the Little White Salmon River is coded-wire tagged and adipose fin clipped. This clip is used to distinguish a tagged hatchery fish at spawning time. The collection of an un-marked (non-adipose clipped) salmon does not equate to the collection of a “wild” fish. All adult fish that have an adipose clip are sampled to retrieve the coded-wire tags for stock assessment purposes. Tag code recoveries are reported to the Pacific States Marine Fish Commission (PSMFC) following the spawning season.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

1,860 adult fall Chinook are needed for full normal production.

7.4.2) **Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:**

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1990	990	670	0		
1991	1,090	781	5		
1992	1,149	747	150		
1993	1,398	1,354	36		
1994	1,335	1,281	26		
1995	1,350	1,312	31		
1996	1,149	1,117	26		
1997	960	957	6		
1998	1,811	1,660	75		
1999	1,081	1,008	17		
2000	1,252	1,163	89		
2001	878	872	6		

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.
Excess adult Chinook are culled at random through the spawning season to keep the hatchery within program goals. See Section 7.8 for discussion of carcass disposal.

7.6) Fish transportation and holding methods.
It is generally not required to transport adult fall Chinook. The holding period for upriver bright fall Chinook salmon is very short (about one month). An aluminum bar-grader is installed between the two adult holding ponds to allow segregation by size of the large fall Chinook from the smaller coho salmon. The common crowding of these fish normally results in injury to the smaller coho, being most evident by increases in broken eggs. The Complex goal for all species is to achieve a 2.5% or less pre-spawning mortality rate during the holding period.

7.7) Describe fish health maintenance and sanitation procedures applied.
At spawning, tissues from adult fish are collected to ascertain viral, bacterial, and parasitic infections and to provide a brood health profile. Personnel from the Lower Columbia River Fish Health Center test for the parasite *Ceratomyxa shasta* and all of the listed pathogens: infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri*; except for *Myxobolus cerebralis*. The minimum number of samples collected (150 females and 60 males) is defined by USFWS policy 713 FW (Fish and Wildlife Service Manual). Sanitation

procedures meet or exceed the minimum guidelines set forth in the IHOT report (1995) and are described in detail in section 8.3.

7.8) Disposition of carcasses.

Upriver bright fall Chinook salmon are not chemically treated during spawning. Carbon dioxide is used to induce anesthesia. These fish are fit for human consumption. First priority for excess and spawned carcasses is provided to the Yakama Nation ceremonial and subsistence program. All other excess carcasses are processed by contractors for the U.S. Department of Justice, Federal Prisons Program.

Carcass outplanting for nutrient enhancement is not currently a goal of this program. However, if current policies change to include nutrient enhancement, outplanting will be done as per LCRFHC recommendations to minimize potential disease transmission to resident and anadromous fish. These recommendations include outplanting carcasses with no gross signs of disease, heat-treating or eviscerating adult carcasses and removing heads before outplanting, and placing carcasses downstream of the hatchery intake.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

There are no known listed natural fish in the target watershed. The risk of disease transmission will be minimized by following IHOT sanitation and fish health maintenance and monitoring guidelines.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Broodstock are collected to represent the full spectrum of the run. Fish are sorted over a one to two day period with ripe females being spawned and green females sent back to the ponds until 100% of the fish have been checked. Enough male fish are sent back to the pond with the green females to ensure a 1:1 spawning ratio. The eggs collected during this sorting process are considered a "take". Male spawners are randomly selected during the take with up to five percent of males used being jacks. The number of jacks spawned on a given day is subjectively defined by hatchery staff up to the five percent maximum and is dependent on availability and ripeness. After all fish have been sorted once and ripe females spawned, a maximum one week period is allowed to pass before the fish are re-sorted and newly ripened females spawned. The objective is to achieve maximum fertilization by spawning fish soon after ovulation and yet avoid the needless handling of green females. The re-sorting process continues until all fish are spawned. Since there are no naturally spawning upriver bright fall Chinook in the watershed, differentiating spawners based on natural stock origin from within the watershed is not a criteria.

8.2) Males.

If the hatchery escapement goal is met, then a 1:1 spawning ratio will be achieved. Achieving this spawning ratio is one of the highest brood stock program goals at the Complex. During low escapement years, males have been re-used on an as-needed basis to maximize the total number of females available to spawn. In low escapement years it is better to spawn the available females (and not lose that genetic material), than discard them. Under these conditions, reusing male fish does not compromise the genetic diversity of the hatchery stocks. It was determined that, in all instances, a minimum escapement need had been met to maintain genetic diversity, although some male fish had to be reused to achieve production goals.

8.3) Fertilization.

It is important to note that at no time in the recent past has the Complex pooled the eggs of females prior to fertilization. Again, as mentioned in section 7.2 above, an intense effort is made to achieve a 1:1 spawning ratio. The following is a detailed description of the spawning protocol.

Adults are crowded from holding ponds and anesthetized using carbon dioxide. Anesthetized adults are then sexed and checked for ripeness. Ripe adults are selected and euthanized. Tails of all ripe females spawned are cut to allow bleeding for approximately 3-5 minutes. Eggs are then removed using a Wyoming knife and collected in iodophor-disinfected colanders to drain ovarian fluid. The eggs are then transferred to iodophor-disinfected stainless steel buckets and sperm is added directly to the eggs. A 1:1 random spawning ratio is maintained and male jacks are used proportionally to their percentage of the run. The buckets containing eggs and sperm of individual (paired) fish are then transferred to the Little White Salmon hatchery nursery building (0.5 kilometers away) where water is added to activate the sperm. This process takes from 5-10 minutes. The fertilized eggs are stirred and allowed to rest for a minimum of thirty seconds, then washed and water hardened for one half hour in a 75 ppm active iodine solution in individual Heath incubator trays. The eggs are incubated using single pass spring or well water.

Aseptic procedures are followed to assure the disinfection of equipment throughout the egg handling process. Tissue samples are collected by fish health specialists to determine the incidence of *Ceratomyxa shasta*, and all of the listed pathogens except *Myxobolus cerebralis,* according to procedures and guidelines in 713 FW and IHOT. Refer to sections 9.1.6 and 9.2.7 for more fish health details.

8.4) Cryopreserved gametes.

Gametes are not cryopreserved at the Little White Salmon NFH.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

There are no known listed natural fish that will be adversely affected by the above described mating scheme.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Data compiled from LWS NFH lot histories and egg summaries.

BROOD YEAR	EGGS TAKEN	% SURVIVAL TO EYE	% SURVIVAL GREEN TO POND	% SURVIVAL POND TO RELEASE
1990	5,295,939	90.6	88.7	93.5
1991	5,332,182	93.0	91.8	80.8
1992	5,640,292	93.0	83.0	97.9
1993	6,675,395	93.0	87.9	99.2
1994	6,390,236	89.2	85.9	97.3
1995	6,331,790	92.3	90.2	84.0
1996	5,352,726	88.7	85.3	97.3
1997	4,584,966	86.2	13.2$^{\Phi}$	96.2
1998	4,461,450*	88.5	87.9	99.1
1999	4,931,822	89.3	89.0	98.7
2000	5,962,075	89.2	88.7	99.1
2001	4,192,595	90.9	90.6	99.0
Average	5,429,289	90.33	81.85	95.18

*Excludes 4,084,800 green eggs shipped to other facilities.

$^{\Phi}$ Refer to Section 5.7 of this document.

9.1.2) Cause for, and disposition of surplus egg takes.

Extra eggs may be taken to safeguard against potential incubation losses. Excess eggs are buried on-station.

9.1.3) Loading densities applied during incubation.

Eggs are placed into incubation trays at a rate of one female (approximately 4,800- 5,000 eggs) per incubation tray. At eye-up, bad eggs are removed, the remaining eggs are enumerated, then placed back into incubation trays at a rate of 5000 eggs per tray. Initial water flows are set at 3 gpm and increased to 5 gpm at hatch.

9.1.4) Incubation conditions.
Water temperature is monitored using temperature loggers taking readings every 30 minutes. Temperatures during incubation range from 43˚F to 50˚F with typical temperatures around 47˚F. Dissolved oxygen levels are not regularly monitored, but have been tested and found to be at, or near saturation. All water for incubation is passed through a 70 micron drumscreen to filter out solids.

9.1.5) Ponding.
Fish are transferred to the raceways from egg trays when most individuals have absorbed their yolk sac (at around 1750 Temperature Units, TUs). At this time eggs destined for an individual raceway are emptied into a transport tank, moved to the appropriate raceway and released directly into the raceway (i.e. swim up and ponding are forced) in late February to mid-March. Average length at ponding is 43 mm.

9.1.6) Fish health maintenance and monitoring.
The current treatment to control fungus on the eggs is a 1,667 ppm drip of formalin for 15 minutes three to five times a week. The first health exam of newly hatched fish occurs when approximately 50% are beyond the yolk sac stage and begin feeding. Sixty fish are sampled and tested for virus. Regular fish health checks are done on a monthly basis by the fish health specialist from the Lower Columbia River Fish Health Center as per the fish health policy in 713 FW.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.
There are no known listed fish that will be affected by incubation procedures.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.
Refer to table in Section 9.1.1 of this document.

9.2.2) Density and loading criteria (goals and actual levels).
Current production goals are to have a final density index of below 0.25 and a flow index of no higher than 1.5 (Piper et al., 1982). Maximum density and loading criteria are for maximum loadings of 4.5 lbs/gpm or 0.87 lbs/ft^3.

9.2.3) Fish rearing conditions
Temperature readings are taken using data loggers taking readings every 30 minutes. Temperatures in the raceways range from 43˚F to 48˚F for the period that the fall Chinook are being raised. Mortalities are removed daily. Raceways are cleaned with a broom while effluent water is drained to a pollution control structure. Cleaning is

performed as needed but no less than once a week. Dissolved oxygen, carbon dioxide and total gas pressure have never been problems and are not recorded on a regular basis. Fish are reared on river water for the final three weeks.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Table B: End of Month Growth Parameters for LWS NFH Fall Chinook Brood Year 2001.

Month	Length (inches)	#/lb	Condition Factor C	Conversion For Month	Density Index	Flow Index
March	2.035	491.0	-	0.87	0.23	2.57
April	2.450	229.9	-	0.90	0.23	1.55
May	3.082	115.6	-	0.67	0.22	1.55
June*	3.280	82.2	0.000346	0.85	0.29	2.05

Data from Lot History, Production for Brood Year 2001 fall Chinook.
* Fish released June 20, 2002.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.
Energy reserve information is not available. This is not a yearling smolt program. Refer to Section 9.2.4 for growth data.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/g.p.m. inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).
The fish are fed BioMoist starter, grower and feed following manufacturer recommendations (generally between 3.5% and 1.0% of body weight per day). They are fed between two and nine times daily depending on fish size. Overall conversions are around 1.0.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
The Lower Columbia River Fish Health Center (LCRFHC) in Underwood, WA provides fish health care for the Little White Salmon NFH as described in the published policy 713 FW in the Fish and Wildlife Service Manual. In addition to this policy, the 1995 annual report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries", chapter 5, by the Integrated Hatchery Operations Team provides further fish health guidelines as approved by state, federal, and tribal agencies. The directives of these two documents exceed the requirements of the Washington State and Tribal fish health agencies which follow the directives in the Washington Co-Managers' Salmonid Disease Control Policy of 1998.

The documents mentioned above provide guidance for preventing or minimizing diseases within and outside of the hatchery. In general, movements of live fish into or out of the hatchery must be approved by the Production Advisory Committee (PAC) and be noted on the Brood Document for the hatchery. If a fish transfer or release is not on the Brood Document, permits from the Washington Department of Fish & Wildlife, the USFWS, and any other states through which the fish travel must be obtained and approved by co-managers. Fish health exam and certification must be done prior to any releases or transfers from the hatchery to minimize risks from possible disease transmittance.

A pathologist from the LCRFHC visits at least once per month to examine fish at the hatchery. From each stock of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes an external and internal examination of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) will be checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted.

A diagnostic exam is done on an as-needed basis determined by the pathologist or requested by hatchery personnel. Sick, dying, and/or fish with unusual behavior are examined for disease with appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.

At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are tested for the presence of listed pathogens. These pathogens, defined in USFWS policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri*, and *Myxobolus cerebralis*.

Disease outbreaks are uncommon in the upriver bright fall Chinook salmon. However, should a disease outbreak occur, the appropriate strategy for control (chemotherapy or cultural changes) will be recommended by the fish pathologist.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.
Fish are given a 24 hour saltwater challenge before release and observed for survival and outward signs of smoltification, i.e. loss of parr marks, etc. Survival is typically near 100%.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.
New raceways are now being used that are made of colored concrete to better simulate the river bottom where the fish are released. The new raceways are also equipped with baffles to minimize the amount of cleaning necessary and to give the fish a variety of conditions within the raceway to choose from.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

These fish are not listed. There are no listed fish under propagation at this facility at this time.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	0	-	-	-
Unfed Fry	0	-	-	-
Fry	0	-	-	-
Fingerling	2,000,000	90	mid-June	**Little White Salmon River**
Yearling	0	-	-	-

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Little White Salmon River at the Little White Salmon NFH

Release point: River kilometer 2 on the Little White Salmon River, entering the Columbia River at river kilometer 261, approximately 45˚ 42' 30" North Latitude and 121˚ 37' 30" West Longitude (pers. comm. Steve Vigg, NMFS)

Major watershed: Little White Salmon River

Basin or Region: Columbia River

10.3) Actual numbers and sizes of fish released by age class through the program.
Primary Sources: LWS NFH Annual Reports, 1990 to 2001.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size	
1990	-	-	-	-	1,438,372	111/lb	-	-	
1991	-	-	-	-	4,029,158	102/lb	-	-	
1992	-	-	-	-	4,396,178	[illegible]2/lb	-	-	
1993	-	-	-	-	1,866,901	101/lb	-	-	
1994	-	-	-	-	2,757,539	153/lb	-	-	
1995	-	-	-	-	1,967,893	91/lb	-	-	
1996	-	-	-	-	2,097,206	98/lb	-	-	
1997	-	-	-	-	2,153,118	[illegible]9/lb	-	-	
1998	-	-	-	-	1,999,435	[illegible]1/lb	-	-	
1999	-	-	-	-	2,149,397	[illegible]6/lb	-	-	
2000	-	-	-	-	1,970,592	[illegible]6/lb	-	-	
2001	-	-	-	-	1,937,764	109/lb	-	-	
2002	-	-	-	-	2,074,295	[illegible]2/lb	-	-	
Average	-	-	-	-	2,372,142	93.17/lb	-	-	

Data source: LWS NFH annual reports, 1990-2001 and Lot History, Production for BY 2001 URB.

10.4) Actual dates of release and description of release protocols.
Releases of fingerlings for the most recent five years occurred between June 19 and 25. Mid-June was selected for releases to coincide with expected maximum river flows (USFWS, 1990). In normal years the screens are removed from the raceways one or two days before release day to allow some fish to migrate volitionally. On the date of release all remaining fish are forced out of the raceways.

10.5) Fish transportation procedures, if applicable.
The fish covered in this HGMP are not transported off-station. The Yakima River program (1.7 million) will be covered under a separate HGMP (Yakama Nation, BPA funded)

10.6) Acclimation procedures
Spring water used for rearing is switched to straight river water in late May to properly imprint the fish on the Little White Salmon River.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Approximately 10% of the fish released from Little White NFH are coded wire tagged and adipose fin clipped.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Any fish identified as excess to program needs are destroyed. This has not occurred since the inception of the program.

10.9) Fish health certification procedures applied pre-release.

At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are tested for the presence of the listed pathogens. These pathogens, defined in USFWS policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri*, and *Myxobolus cerebralis*.

10.10) Emergency release procedures in response to flooding or water system failure.

Every effort will be made to avoid emergency releases. Emergency releases, if necessary, would be accomplished by removal of outlet screens and damboards at the lower end of the raceways. This is the same method used for final scheduled releases.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Fish health procedures outlined in this document and listed in the Fish and Wildlife Service's fish health policy as well as the IHOT document, minimize potential negative effects on natural populations of fish by lessening the chance for horizontally transmitted diseases when encountering Little White Salmon upriver brights in the migration corridor or in the ocean. See section 3.5 of this document for a detailed discussion of potential ecological interactions.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Refer to Section 1.10 of this document for information on the Performance Indicators.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

The existing monitoring and evaluation work for the upriver bright fall Chinook program has been in place since the inception of the program, continuously funded by NMFS as provided under the Mitchell Act and by the Corps of Engineers for John Day Dam mitigation.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.
Design and implementation of all research activities associated with monitoring and evaluation of the URB fall Chinook program operations follow peer review by internal (USFWS) staff as well as external interested parties including NMFS, WDFW, and ODFW and various academic entities.

SECTION 12. RESEARCH

12.1) Objective or purpose.
There is currently no research beyond normal monitoring and evaluation of the stock using CWT tags due to construction on the new raceways. Research projects in the coming years may include density studies, feed trials, and evaluation of baffled vs unbaffled raceways. These studies will be necessary to evaluate performance of the fall Chinook in the new, larger, colored, raceways. These studies should have no effect on listed species.

12.2) Cooperating and funding agencies.
This program currently has no funding allocated for research.

12.3) Principle investigator or project supervisor and staff.
Speros Doulos (Complex Manager), Jim Rockowski (Deputy Complex Manager), Peter Long (Fishery Biologist), Mary Stad (Fishery Biologist)

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.
Not listed.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.
N/A

12.6) Dates or time period in which research activity occurs.
N/A

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.
N/A

12.8) Expected type and effects of take and potential for injury or mortality.
N/A

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).
N/A

12.10) Alternative methods to achieve project objectives.
N/A

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
N/A

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.
N/A

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief."

Name, Title, and Signature of Applicant:

Certified by______________________________ Date:_____________

ADDENDUM A. <u>PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS.</u> (Anadromous salmonid effects are addressed in Section 2)

15.1) <u>List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.</u>

Section 7 permits were obtained for construction projects from NMFS (WSB-00-360 dated 06/28/2000 good through 09/30/2001) and from an Internal Section 7 Consultation (permit number 1-3-00-FW-1914, 1915) from the USFWS Western Washington Office in Lacey, Washington.

15.2) <u>Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.</u>

Species	Status	Projected take
1) **Bald Eagle (*Haliaeetus leucocephalus*)**	Listed	None
2) Northern spotted owl(*Strix occidentalis caurina)*	Listed	None
3) Bull trout (*Salvelinus confluentus*)	Listed	None
4) California wolverine (*Gulo gulo luteus*)	Concern	None
5) Cascades frog (*Rana cascadae*)	Concern	None
6) **Larch Mtn salamander (*Plethodon larselli*)**	Concern	None
7) Long-eared myotis bat (*Myotis evotis*)	Concern	None
8) Long-legged myotis bat (*Myotis volans*)	Concern	None
9)Northern goshawk (*Accipiter gentilis*)	Concern	None
10) Northwestern pond turtle (*Clemmys marmorata marmorata*)	Concern	None
11) Olive sided flycatcher (*Cantopus cooperi*)	Concern	None
12) Pacific Townsend's big-eared bat (*Corynorhynus townsendii townsendii)*	Concern	None
13) Pacific lamprey (*Lampetra tridentata*)	Concern	None
14) River lamprey (*Lampetra ayresi*)	Concern	None
15) **Tailed frog (*Ascaphus truei*)**	Concern	None
16) Western toad (*Bufo boreas*)	Concern	None
17) *Penstemon barrettiae* (Barrett's beardtongue)	Concern	None
18) *Rorippa columbiae* (Columbia yellow-cress)	Concern	None
19) *Sisyrinchium sarmentosum* (pale blue-eyed grass)	Concern	None

Species in **bold** were specific occurrences located on the database within a one mile radius of the project site.

15.3) <u>Analyze effects.</u>

None of the above listed species is likely to be adversely affected by this program. Bald eagles benefit from the program as they are regularly seen feeding on salmon carcasses in the river below the hatchery throughout the fall and winter months. See section 3.5 of this document for detailed information on program effects on aquatic species.

15.4 Actions taken to minimize potential effects.

15.5 References

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: ________________________ ESU/Population: ______________________________ Activity: __________________				
Location of hatchery activity: ____________________ Dates of activity: __________________ Hatchery program operator: ________________				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and released)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.